

A NEW ELECTRONIC TRANSITION OF S₂ IN THE VACUUM ULTRAVIOLET REGION

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TANAKA AND OGAWA,¹ in the course of their investigations on the emission spectrum of S₂ in the vacuum ultraviolet, observed four new band systems in the region 1750–2130 Å. From a study of their vibrational structure, they showed that three of the band systems involved transitions to a common lower electronic state, x , and the fourth band system to the ground state, X ³Σ_g⁻. They also obtained in emission the band systems, C-X and D-X, which were known earlier in absorption. These bands were however very much weaker compared to the new band systems. During the course of our studies on the emission spectrum of S₂, we have been able to record all the bands reported by Tanaka and Ogawa and, in addition, a new band system containing a single v'' -progression of bands. The present note gives the vibrational structure of these new bands.

The emission spectrum of S₂ has been excited in an electrodeless microwave discharge (2450 Mc/sec. at 90 watts power) through sulphur and helium at a pressure of 2–3 mm. of Hg under static condition. The resulting spectrum has been photographed on a 3 m. normal incidence vacuum grating spectrograph having a plate factor of 2.9 Å/mm. The new band system lies in the region 1780–1850 Å and is shown in Fig. 1. As can be seen from the

ing $\Delta \lambda = \pm 1$. The wave number data of the P-heads of the four new bands are given in the Deslandres Table I. They form a v'' -progression with $v' = 0$. The upper vibrational level v' is not uniquely determined to be zero. The $\Delta G''(1/2)$, $\Delta G''(3/2)$ and $\Delta G''(5/2)$ values as well as the second differences $\Delta^2 G''$ are given below the band head data. They agree well with the corresponding values of the x state of Tanaka and Ogawa which are also included in the table in italics for comparison. It is therefore evident that the new bands arise from a new electronic level to the x state of Tanaka and Ogawa.

TABLE I
Deslandres scheme of vacuum wave numbers of the band heads of the new system

v'	v''	0	1	2	3
0		56077.7	55385.5	54698.1	54016.1
$\Delta G''(v+1/2)$		692.2	687.4	682.0	
		693.0	686.3	679.6	
$\Delta^2 G$			4.7	5.4	

Values of $\Delta G''(v+1/2)$ given in italics are from the data of Tanaka and Ogawa.

The e-X bands also occur in the same spectral region (Fig. 1). They are also found to be

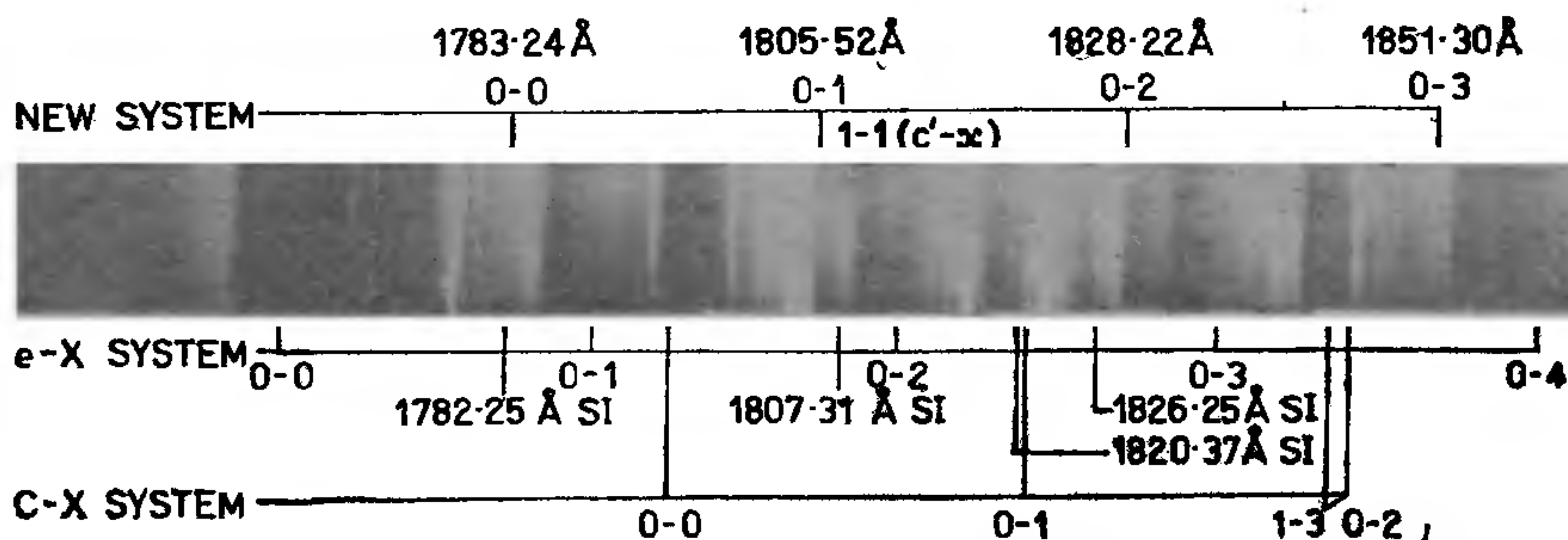


FIG. 1. Emission spectrum of S₂.

spectrogram, the bands are all degraded to shorter wavelengths. Each band consists of a P head and a Q head and their average separation is about 9 cm.⁻¹ Such a band structure is characteristic of an electronic transition involv-

double-headed with an average separation of about 14 cm.⁻¹

1. Tanaka, Y. and Ogawa, M., *J. Chem. Phys.*, 1962
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